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RUBBER

A Wonder Story

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George Carlson

THE GAME OF BALL
that changed the World's History

RUBBER

A
Wonder Story

by
JOHN MARTIN
*Editor of JOHN MARTIN'S BOOK
The Child's Magazine*



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An Introductory Note.



We have undertaken to print this and succeeding booklets, telling you how rubber is grown, gathered and then made useful, for this reason:

The United States Rubber Company, as the largest rubber manufacturer in the world, wants the coming generations of our country to have some understanding of the importance of rubber in our every day life.

We hope to interest and inform you. We believe the rubber industry will be better off if the future citizens of our country know more about it.



PRESIDENT.



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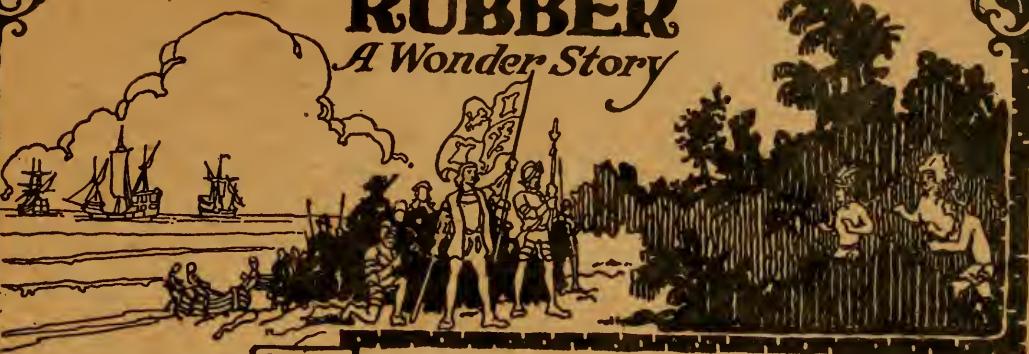
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RUBBER

A Wonder Story



CHAPTER 1 DISCOVERY *and* ROMANCE

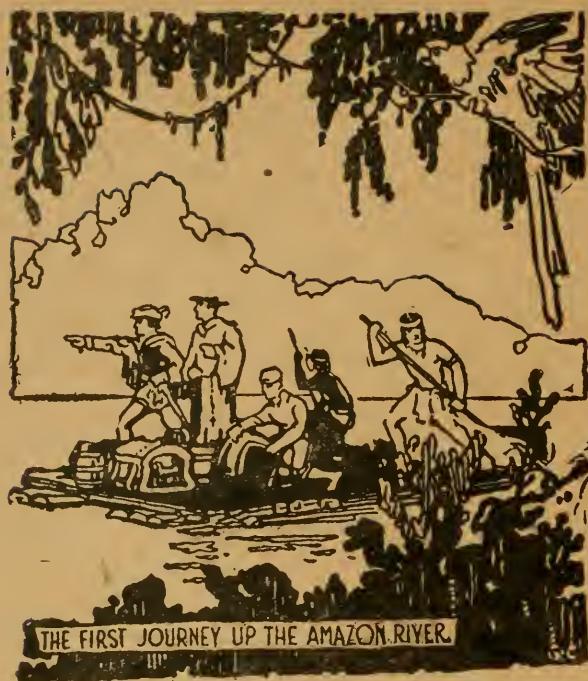
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AVE you ever heard how a game of ball changed the daily life of the entire civilized world? It was no National League game played by big salaried stars, with thousands of people looking on, nor was it written up on the sporting pages of great dailies. It was played on a sandy beach more than four hundred years ago, by some half-naked Indian boys who little knew the *big game* they were playing.

You would have but one answer if you were asked, "What did Columbus discover in 1492?" But what he discovered on his second voyage is not quite so easy to say. He was looking for gold when he landed on the island of Hayti on that second trip, so his eyes were blind to the importance of the simple child's play which he saw on the sand between the palm trees and the sea. Instead of the coveted gold, he took back to Europe, just as curiosities, some strange black balls given him by these Indian boys, which, they told him, were made from *the hardened juice of a tree*.

The little Spanish boys and girls were used to playing with balls made of rags and with pigs' bladders, and you may imagine what a treasure were these *bouncing* balls of the Indians. But the men who sent out this second expedition did not give the rubber balls much thought and certainly no value. Since Columbus brought back no gold, he was thrown into prison for debt, and he never suspected how men, four hundred years later would turn that strange, gummy tree juice into more gold than King Ferdinand and Queen Isabella and all the princes of Europe ever dreamed of.

In the next century after Columbus' travels, the Portuguese founded



the colony of Brazil on the continent of South America. Their settlements were near the coast and they did not begin to explore the great Amazon region for a hundred years or so. The journey down this great river which Mr. Roosevelt took so many years later, was first made by a Portuguese missionary. Here he found the same gummy tree juice of the West Indies, but the natives had discovered that, besides being elastic, it was waterproof, and they were making shoes that would keep out water. You

can imagine a native boy spilling some of this liquid on his foot, then covering it, as he might with a mud pie, and when it dried, wiggling his toes to find that he had the first and perhaps the best fitting rubber shoe that ever was made.

Little by little samples of this new substance found their way to Europe. But it was another hundred years before thoughtful men believed it worth while to investigate this gum, and in 1731 the Paris Academy of Science sent some explorers to learn about it. One of these Frenchmen, La Condamine, wrote of a tree called "Heve." He said: "*There flows from this tree a liquor which hardens gradually and blackens in the air.*" He found the people of Quito waterproofing cloth with it, and the Amazon Indians were making boots which, when blackened in smoke, looked like leather. Most interesting of all, they coated bottle-shaped moulds, and when the gum had hardened, they would break the mould, shaking the pieces out of the neck, leaving an unbreakable bottle that would hold liquids.

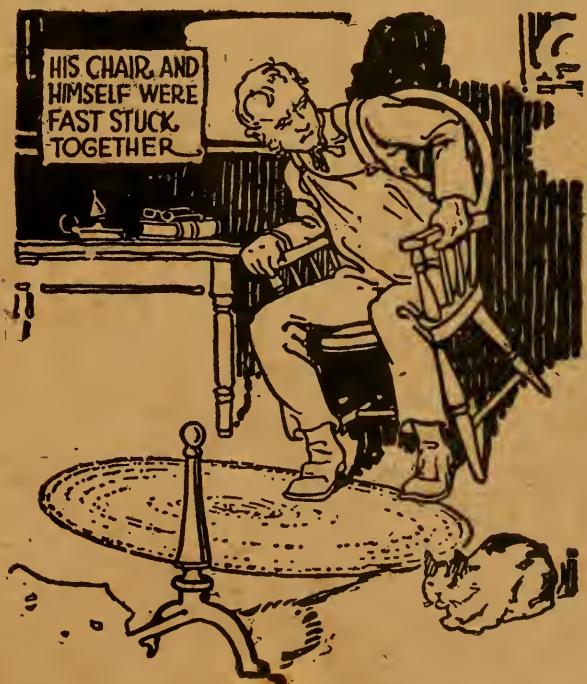
It was not long after that Lisbon began to import some of these crudely fashioned rubber articles, and it is said that, in 1755, the King of Portugal sent to Brazil several pairs of his royal boots to be waterproofed. A few years later the Government of Para sent him a full suit of rubber clothes.

But, for all that, this elastic gum was for the most part only a curiosity, and few people knew there was such a thing.

About the year 1770, a black, bouncing ball of this *caoutchouc*, after many travels, found its way to England, and Priestly, the man who gave us oxygen, learned that it would rub out pencil-marks. Then and there he named it, what you have probably guessed long before this, *rub-ber*. Nearly every language except English uses some form of the native word, *caoutchouc*, which means, *weeping tree*. After Priestly's discovery, one inch "rubbers" sold for three shillings, or about seventy-five cents each, but artists were glad to pay even that price, because it made their work so much easier.

In 1800, Brazil was the only country manufacturing rubber articles, and her best market soon proved to be North America. Probably the first rubber this country saw was brought in New England clipper ships for ballast in the form of crude lumps and balls. Rubber shoes, water-bottles, powder-flasks, and tobacco-pouches found buyers in the American ports, but rubber shoes were most in demand.

Presently some Americans began to import raw rubber and to manufacture rubber goods of their own, and a Scotchman named McIntosh found a way of waterproofing by spreading between two strips of cloth a thin sheet of rubber dissolved in coal naphtha. His name still stands for raincoats to-day. This rubber clothing shared favor with rubber shoes, but its popularity was short-lived for it did not wear well and was almost as sensitive to temperature as molasses and butter. The rubber shoes and coats got hard and stiff in winter, and soft and sticky in summer. A man wearing a pair of rubber overalls who sat down too near a warm stove soon found that his overalls, his chair, and himself were stuck fast together. The first rubber coats became so stiff in cold weather



that, when you took one off, you could stand it up in the middle of the floor and go away and leave it, for it would stand like a tent until the rubber thawed out, and when thawed, it was almost as uncomfortable as is fly-paper to the fly.

One day, Charles Goodyear, a Connecticut hardware merchant of an inventive turn of mind, went to a store to buy a life preserver. The only ones he could find were imperfect affairs, but they drew his attention to the study of rubber and presently he was thinking of it by day and dreaming of it by night. *Rubber* became a passion. He neglected his business and grew poorer than the turkey Job kept. He pawned his goods and borrowed from his friends until they dreaded to have him and his rubber talk enter their



doors. He even pawned his children's books to get money for his experiments. His family hardly dared walk into a room or sit down at a table for fear they would come upon some of his ever present *gum elastic*, as he called it.

With an inventor's tireless patience and endless hope, he tried one combination after another but they all failed. He had an entire suit of rubber clothes, and one of his friends once said, "Mr. Goodyear is the man you will see walking about all dressed in rubber, carrying a rubber purse with nothing in it."

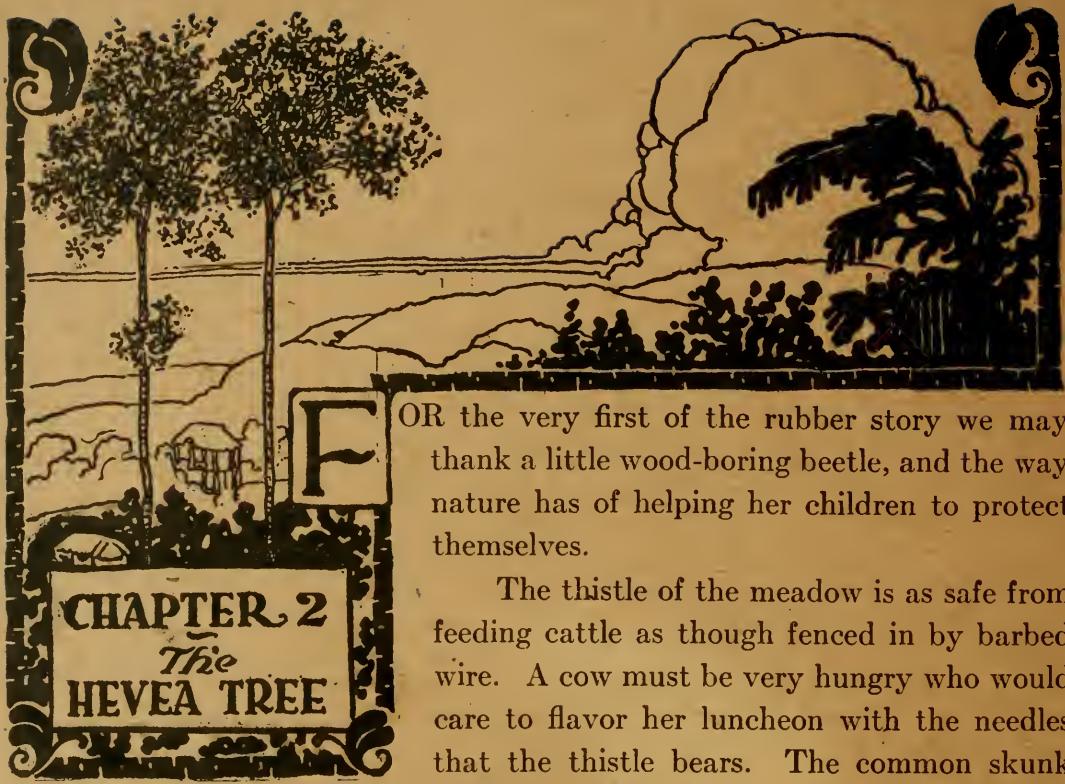
Finally, in 1839, when he was mixing some rubber and sulphur together, a thing he had often done before, he accidentally dropped a spoonful on the

hot stove. Rubber melts at such a low temperature that he had never thought of applying great heat. Instead of melting, as he expected it would do, it flattened out like a silver dollar. It bent and stretched easily without cracking or breaking; it always snapped back to its original shape, and, strangest of all, it was no longer sticky. Apparently half the problem was solved. Whether his new mixture would stand cold he had yet to find out, so he nailed it on the outside of the door and went to bed. Probably he slept but little and was up early to find his rubber quite unaffected by the cold. Then he knew that he had made a real discovery and he named the process "vulcanizing" after the Roman god of fire. "*Vulcanizing*" simply means, mixing sulphur and pure rubber and then applying heat.

Two years passed before Goodyear could stir any one with faith enough to invest money in his discovery; but in 1844 he was able to take out the first of more than sixty patents which were granted to him for applying his original process to various uses. Many times he fought for his rights in the courts, and in one of the most famous cases he was defended by Daniel Webster and opposed by Rufus Choate.

Shortly after Goodyear discovered how to vulcanize rubber, he permitted, under his patent rights, L. Candee & Company of New Haven, and also the Goodyear Metallic Rubber Shoe Company, to use his methods. In 1841 the Goodyear India Rubber Glove Company also received the same permission. Since then many companies have used the name *Goodyear*, but the three companies named above, all part of the United States Rubber Company, are the only ones who had direct connection with Charles Goodyear.

From the moment of Goodyear's discovery, the successful future of the use of rubber was certain. Rubber, a laughing stock and a joke before that time, has turned the laugh into reverent respect, and now no family could be comfortable or happy without it. For baby there would be no teething ring, no nipple for his bottle, no hot water-bottle for his stomachache, no rubber doll, and no tires for his go-cart. You would have to give up your rain-coat, bicycle, baseball and football, to say nothing of the fifty thousand other things that make the manufacture of rubber one of the greatest industries of the world.



CHAPTER 2 *The* HEVEA TREE

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OR the very first of the rubber story we may thank a little wood-boring beetle, and the way nature has of helping her children to protect themselves.

The thistle of the meadow is as safe from feeding cattle as though fenced in by barbed wire. A cow must be very hungry who would care to flavor her luncheon with the needles that the thistle bears. The common skunk cabbage would make a tempting meal for her

after a winter of dry feeding, had not nature given it an odor that disgusts spring breakfast hunters. The milkweed welcomes the bees and flies that help to distribute her pollen where she wants it spread, but she has her own way of punishing the useless thieves that trespass up her stalk. Wherever the hooks of their feet pierce her tender skin, she pours out a milky juice to bedraggle the insect's feet and body, and it is a lucky bug that succeeds in escaping before this juice hardens, holding him a prisoner condemned to die.

This latter protection is the way nature takes of giving us rubber. All over the world there are plants with the same ability that the milkweed has, but it is especially true of certain trees and vines of the tropics. As soon as a beetle begins to bore into the bark of one of these tropical trees, the plant pours out a sticky, milky fluid that kills the insect at once. But if that were all, the wound would remain open, ready for the next robber who came along. In order that the break may be healed, a cement is necessary, but not a hard, unyielding one, for that would crumble away with the motion of the tree in the wind. So, with the perfection of Mother Nature's working, the very plant juice that has done duty as a poison is hardened

into an *elastic stopper*, so that, no matter how far the tree may sway and tug at the wound, the filling gives and stretches, true to the task it has to perform.

This was the juice the crafty savage induced the tree to give up. Wherever the bark was cut, the fluid poured forth to heal the break and hardened like blood on a cut finger. The native caught it while it was still soft and applied it to his simple needs.

Scientific men call this juice *latex*, but let us call it *rubber milk*, for it is similar to animal's milk in three ways: it contains tiny particles that rise to the top like cream, it spoils quickly, and it is pure white.

The particles in cow's milk are full of fats which make it good for us to drink. But tree's milk has tiny atoms of rubber and resin and other things, and it took a long time to discover which of the *three hundred and fifty rubber-producing vines and trees* was the prize milker of the tropics and gave the largest amount of pure rubber. Finally, the *Hevea*, the very tree the Frenchman wrote about, proved to be the best, and, although by no means the only tree of commercial value, it is acknowledged the greatest of rubber trees.

This *Hevea* tree grows sixty feet high and when full grown, is eight or ten feet around. It rises as straight as an elm, with high branching limbs and long, smooth, three-lobed leaves. Sprays of pale flowers blossom upon it in August and in a few months the seeds ripen, which resemble horse-chestnuts, only they are in three parts containing speckled seeds that look like smooth, slightly flattened-nutmegs. The outer covering bursts with a loud report, the seeds shooting in all directions. This is nature's clever scheme to spread the *Hevea* family. The tree grows wild in the hot, damp forests of the Amazon valley and

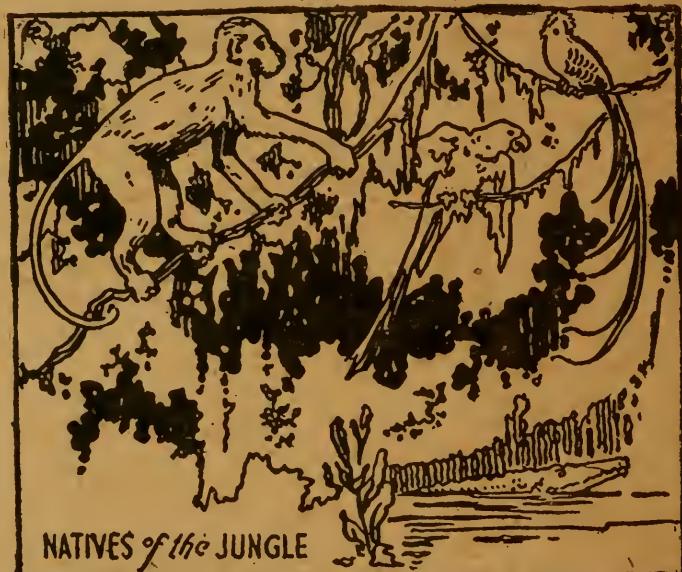


in other parts of South America that have the same climate, which must be uniform all the year round, from eighty-nine to ninety-four degrees at noon, and never lower than seventy-three degrees at night. That tropical country has a rainy season which lasts half the year, though the other season is by no means a dry one, and so, for half the time, the jungles are flooded, soft morasses which exactly suit the Hevea tree.

These rubber storehouses had been growing for thousands of years in the Amazon jungle with their wealth securely sealed up in their bark, the peck of a bird, the boring of a beetle, or the scratch of a climbing animal being the only draft upon their treasure. The trees around the mouth of the river supplied whatever was needed for the little manufacturing that was at first done. But the discovery that made a universal use for rubber changed all this. Brazil was surprised to find what great treasure her forests contained. The large rubber tracts a thousand miles up the river were located, and she began in a more serious way to think of her rubber.

Now let us drop three-quarters of a century that has passed since the demand for rubber began and follow a rubber gatherer of to-day while he collects the rubber milk that makes sneakers and rubber tires and countless other necessities for you and for all of us.

The amount of rubber taken out of Brazil each season is entirely a matter of laborers. To get a rubber estate in the Amazon region is easy. The land costs nothing, only a small registration fee being charged by the government. Life in the rubber districts is hard, the surroundings uncomfortable, and the locations are remote, so rubber gathering is no easy job, and laborers are not scrambling over each other for the privilege. Years



when the dry season has killed the crops and thinned the cattle, so releasing men, are best from the *aviador*'s point of view. This *aviador* is a sort of go-between or contractor who supplies the connecting link between the native laborer, his rubber, and the world market. He it is who secures the workers, supplies them with what they need in the way of provisions and clothing, and advances money for the journey to the forests.

Late in March, or early in April while the water is still high he loads his workers on river boats for a journey of perhaps a month or six weeks. Quarrelsome, monotonous days are those. Finally they reach the rubber region, and a number of men are dropped at each *seringal*. This is a tiny village, the center of the rubber operations for a certain area. The thatched huts of the workers or *seringueiros* cluster about the tile roofed house of the manager, the office, and store. Since the forests are not worked more than a mile inland, these *seringals* are always on the river bank and on rising ground to escape the annual rising of the river waters.

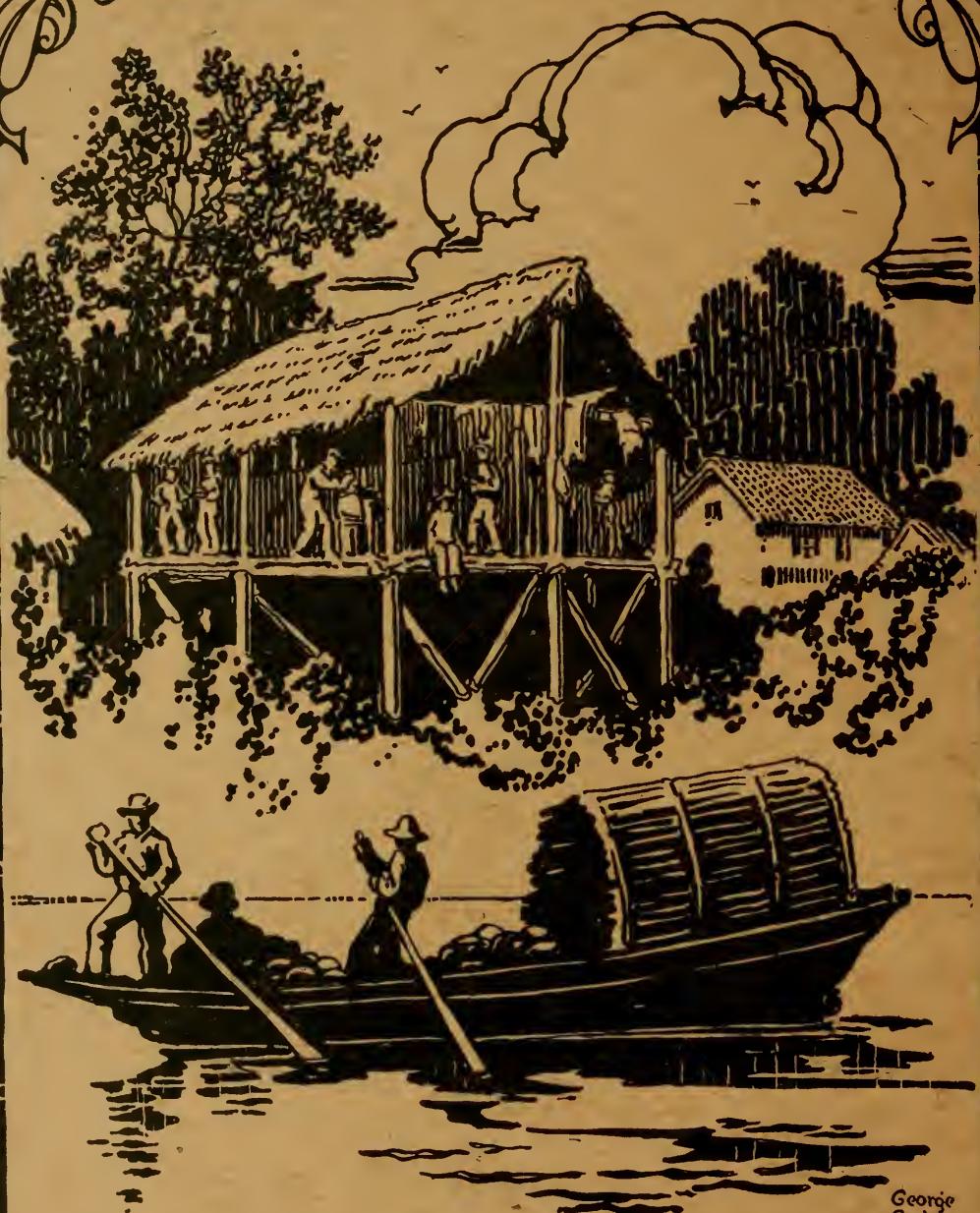


NOTES:—*Aviador* is pronounced *ah-vee-ah-dor*, and means contractor or employment agent.

Seringals is pronounced *say-ring-gals*, and means villages or encampments.

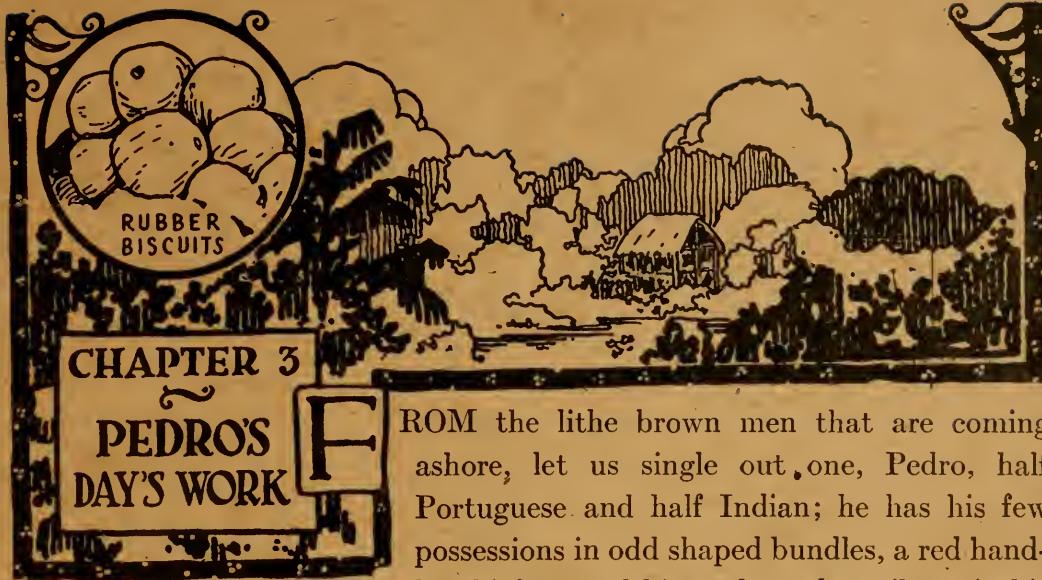
Seringueiros is pronounced *say-ring-gay-ee-ros*, and means rubber workers. It is not strictly a Portuguese word but a colloquialism used in Brazil.





George
Carlson

NATIVE BOAT PASSING A SERINGAL BY THE RIVER



CHAPTER 3 PEDRO'S DAY'S WORK

ROM the lithe brown men that are coming ashore, let us single out one, Pedro, half Portuguese and half Indian; he has his few possessions in odd shaped bundles, a red handkerchief around his neck, and a stiletto in his belt. Some of the *seringueiros* will work near the *seringal* center, but Pedro and his two or three companions tramp off to a distant hut which will be their home for the next six months. On a framework of poles, the thatched roof is mounted; a floor is raised well above the dampness, and the dwelling is made. There is plenty of ventilation for it is open on all sides. Some boxes and cooking utensils complete its furnishings.

The first task of these men is to chop out the jungle paths of a year ago, for with the rising of the Amazon and the luxuriant growth of the tropics, they are entirely overgrown. There are hundreds of kinds of trees in the forest, tangled together with vines, and the Heveas may be from ten to seventy-five feet apart. So this path must be a sort of loop, connecting a hundred trees or more, and returning to the starting point. These paths are called *estradas*. Each man cuts perhaps two of these paths with a two-foot circle about each tree to give him room to work.

Now he is ready for the tapping. The rubber milk runs best early in the day, so our man is up at four, and after a hasty swallow of coffee,



NOTES.—Pedro is pronounced *Pay-dro*, its English equivalent is Peter.

Estradas is pronounced *es-tra-das*, and means paths.

is on his way, supplied with a peculiarly shaped knife and several hundred tin cups about the size of paper drinking cups.

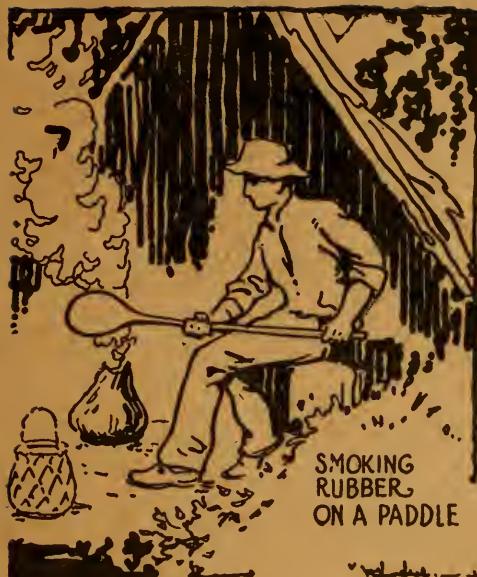
When he comes to a Hevea, he finds it scarred in certain distinct lines. These are the remains of former tappings. In tapping maple-trees, for syrup, it is the *sap* of the tree that you draw. But the rubber milk is different for it is hidden in cells just under the bark, so the cutting must be carefully done, as the wooden heart of the tree must never be wounded.

Our Pedro is a careful worker so he uses his knife skilfully, making a thin gash throughout the length of the old scar, at the bottom of each cut at-



taching one of his little cups. Tin cups have a bit of metal to bend over the bark. Pottery cups are attached by a piece of soft clay. When our man has been working a week or two, he knows his trees as well as the farmer boy knows his cows, whether they give thick milk or thin, much or little. Some give ten or twenty times as much as others, and some go quite dry. The average yield of a mature tree is about six ounces a day, enough to fill a baby's bottle. A good tree will average ten pounds of rubber in a year.

Back to his starting place, Pedro drops his knife and takes a pail; making the same round again, but this time emptying the cups, and perhaps it is ten o'clock when he staggers into his hut with a full milk pail and big appetite for breakfast of dried beef and beans which he must prepare for himself. Although the jungle is the home of many wild beasts and reptiles,

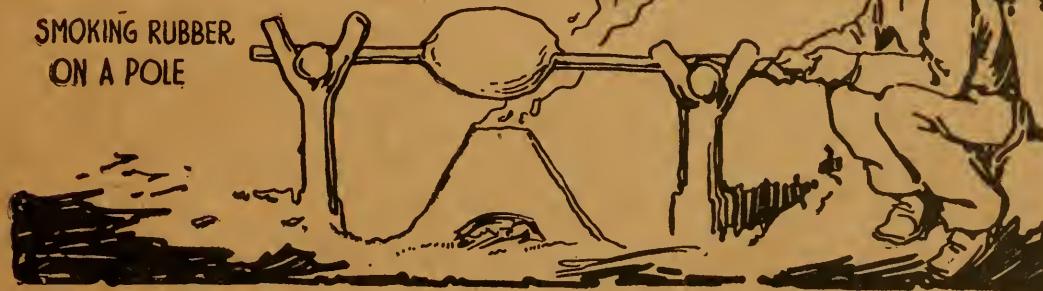


SMOKING RUBBER
ON A PADDLE

sand shovel, dips it in the milk, and holds it over the thick, black smoke that is now pouring from the top of his little furnace. The milky coating soon becomes a yellowish color, and he knows it is thoroughly dry. Again and again he dips the paddle into the milk until layer upon layer is dried and the morning's milk yield is used up. A practiced hand can, in this way, dry five or six pounds of rubber in an hour.

A worker may start every day a new "pelle," or biscuit, as the lump is called, but he is more likely to add to the first one. The farther up the river is the *seringal*, the larger the biscuits, for large ones are less apt to be lost in the long journey. The large biscuits are called *hams* and may weigh one hundred and fifty pounds.

Saturday is market day in the *seringal*. Pedro and his companions



SMOKING RUBBER
ON A POLE

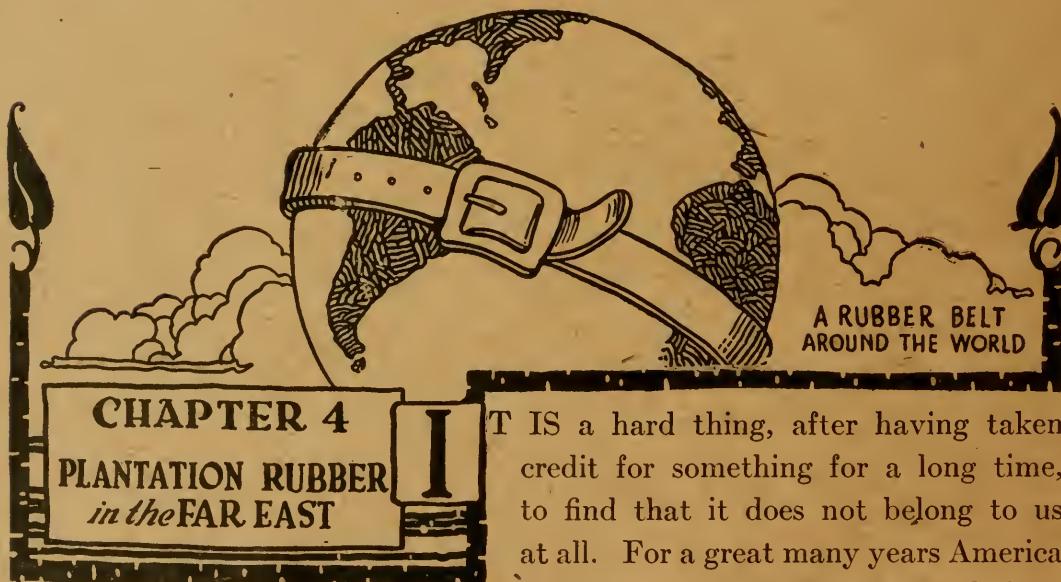
Pedro knows that they rarely trouble man, and he has no fear of them. His greatest inconvenience is probably having an occasional cup stolen by an inquisitive monkey who may later throw it down on his head.

Breakfast over, Pedro starts on the real work of the day, for the morning's milk supply must be hardened for market immediately or it will spoil. Over a fire of wood and palm nuts he places a crude funnel with the small end at the top. Then he takes a paddle, something like a child's

load their week's rubber on their backs or into crude boats, bring it to headquarters to be weighed and credited, and return again with a week's stores and whatever gossip is to be picked up by the way.

The rubber is shipped down to the *aviador* who sells it at auction. From the money that it brings, he takes twenty per cent. commission and something toward Pedro's debt to him, and the rest he sends back to our man.

This is the daily life of the gatherer of wild rubber. The simple methods which he continues to use, year after year, have only recently been improved upon, for "fine Para rubber," collected in biscuits, smoked over palm nuts, and named from the Brazilian city where it is marketed, is still one of the highest grades of rubber.



to the world three important things, Indian corn, tobacco, and rubber. But one day some one came back from a journey through the East with the report that there was a *rubber belt around the world!* By which he meant that for two hundred and fifty miles on either side of the equator, between the thirtieth parallels, was the kind of damp, hot weather where rubber-producing trees lived.

Africa, as well as the tropical islands of the ocean, had many

kinds of their own, and they all began to think they might have a part in rubbing the Aladdin's lamp that Brazil had found.

For some time, in fact, one-third of all the rubber used came from Africa, but its quality was poor. This was partly the fault of the trees which were different from the Hevea, but chiefly because the natives were careless. They would let the milk run down the side of the tree into a hollow, at most lining the hole with leaves, letting the sun harden the juice as best it might. Sometimes they would smear the milk over their own skins where the

natural heat of the body would harden it, and by night they were ready to tear off their rubber suits and make them into balls. Their idea was to get the most milk in the shortest time, whether it destroyed the tree was no concern of theirs. They would cut the trees down altogether, or, they would climb them, tearing the bark with deep gashes as they came down, afterward rubbing salt into the cuts to make the juice harden at once. Standing at the foot of the tree it was easy to rip this rubber for the length of the cut. These strings the savage wound into a ball which became so large, he must lie on his back to handle it, using his chest for a rest.

But by far the most important rubber question in the East is that of the plantation. Cultivated rubber is only an infant industry, but in its brief forty years of life it has become so strong that its mother, *wild rubber*, has good reason for worry lest she be altogether forgotten.

Men ahead of their time are almost always laughed at for fanatics and dreamers, and Mr. H. A. Wickham, an Englishman living in South America who believed in cultivated rubber, had his share of ridicule. He saw no reason why, with a like climate and soil, seeds put into the ground by hand should not



have as much success as those shot from seed cases far up in the tree boughs.

Wickham planted some Hevea seeds around his Brazilian home and started a sort of simple tree nursery. He wrote a book about his ideas which came into the hands of the Director of Kew Gardens in England and of an official of the Indian Government. These men thought his plan was worth trying, but for him to get the seeds out of South America was another problem. Even then Brazil was jealous of her monopoly, and had she known what kind of cargo the *Amazonas* carried down the river early in 1876



she would have had good reason to chase it with gunboats and bring it back.

The task was not an easy one, for the seeds must be collected at the ripening season and, because they are so rich in oil and lose their vitality so soon, they had to be packed with the greatest care and with proper ventilation. At length Wickham got the seeds aboard a boat he was able to charter and finally landed them under the glass roofs of Kew Garden hothouses. In two weeks, seven thousand young Hevea trees had sprouted on the foreign soil of England, and it is the children and grandchildren of this brave company that to-day people the Eastern plantations with rubber trees.

When these plants were strong enough, they were shipped in small glass-roofed boxes, well supplied with proper soil and moisture, to Ceylon, Singapore, and other British possessions. There they were planted in



Botanical Gardens where they had the greatest care and attention. When these trees were tapped a few years later, the yield of milk proved Wickham's dream to have the firmest kind of foundation in practical use.

Now, rubber plantations dot the tropics almost everywhere that climate and soil are right, especially in Ceylon, Malaya, Java, Sumatra and Borneo, as well as in the warm belt of South and Central America. It is not

because there is fear of the wild rubber supply giving out that these plantations have been started, for there are, in the Brazilian forests alone, perhaps three hundred million trees still untouched. But it is so hard to get the rubber out, transportation is so poor, limited entirely to the waterways, and life in the undeveloped country is so unhealthful and uncomfortable, that the wild product can never be sold as cheaply as we hope plantation rubber may be. And besides, cultivated rubber will come to market far cleaner and with much lower percentage of waste, for the modern rubber-drying houses are little less clean than a dairy.

Although rubber planting has long past the experimental stage, the method of cultivation is far from uniform, every planter's experience giving him his own ideas. Most growers agree that well-weeded plantations without undergrowth are best, for this avoids the danger of fire which is almost impossible to control, once it is started in tropical brush.

The first five years of a plantation is a time of anxious waiting with need for great patience, for until the trees measure two feet in circumference three feet from the ground, they are not ready to be tapped. Then the yield is slow, not more than three quarters of a pound of rubber coming from a tree in its first year. But it increases steadily and a thirty year old tree in Ceylon was known to give ninety-six and a half pounds in 1910.

Life on a plantation is a very different thing from the forest *seringal* of South America. The planter, a white man, has his bungalow, sometimes

he has his family with him. The overseers and assistants are usually white men, too, who live together. Then there are long rows of laborers' houses, the "quarters," where black and yellow children swarm with the broad acres of the plantation for a playground.

As in the jungle, the rubber gatherers start soon after it is light, for the milk stops flowing a few hours after sunrise. But it is not the lonely occupation of our poor Pedro, the *seringueiro*. The workers, men and women, come in groups from the quarters, gay in turbans and sashes, nose-rings and bangles, for the morning milking. Each one carries a tool, somewhat like a chisel, with which to cut a shaving of bark, following the cut that he finds on the tree, and from which trickles the juice into the enamel cups placed for it. There are many ways of cutting, the V, the herring-bone, half herring-bone, the spiral, and others. Wild trees have a rest of half a year during the wet season. Plantation milk is collected all the year through, but it is good to rest these trees also by tapping only on alternate days, or by giving them holidays of a week or more.

Instead of the palm nut furnace of the Brazilian, we now have modern drying machinery. The first plantation method of drying rubber was to pour it into flat soup-plates. When it had hardened into a dough or putty-like mass, it was rolled with a rolling-pin to squeeze out the water, and the round mats or *doilies* of rubber were hung on a line to dry. Now acid hurries the hardening in great pans from which the rubber is taken in dough-like lumps. These are put through rollers from which comes a sheet of "crepe" rubber, ready for drying and smoking, after which it is ready for market.

After long journeys by boat, bullock cart, rail, and steamer, the crude rubber finally comes to its destination at one of the great world markets, London, Antwerp, or New York, where samples are taken, the dealers notified, and it is finally auctioned for the best prices it will bring. Five-sixths of the world's rubber now comes from plantations, and nearly three-fourths of the entire world production is used in the United States.





A LAST WORD F

ROM the markets to the homes, and offices, and garages of the nation the adventures of rubber are too varied to be told in this story. Goodyear's discovery was merely the beginning of

making rubber practical. He, himself, experimented with it all his lifetime. During many years rubber was manufactured by guess, much as the Southern mammy does her cooking. Now every rubber manufacturer has a great staff of scientific cooks, or chemists, who spend all their time hunting for new combinations.

Mother probably has her special blend of coffee that she prefers above all others. Father may insist upon a particular mixture of tobacco; so the rubber chemist must find a definite combination for every kind of use to which rubber is put. The reason some companies have better goods than others is that their chemists have been able to discover better recipes. These recipes are the guarded treasures of the rubber men, for their manufacturing secrets are their real capital and are worth thousands and even millions of dollars.

Scientists are trying to make "synthetic" or artificial rubber, which is, to combine in the laboratory the elements that make rubber, and so rival the methods of the great out of doors where Mother Nature uses the sun, the moisture, and the good, rich earth to bring forth a white, gummy tree juice. But this chemical rubber is very costly, and for a long time, at least, nature's product will be cheaper and better.

How important rubber has become we may gather from the laws Germany passed during the war, punishing any one who threw away an

article made of rubber. Of all the privations which that besieged country was suffering, rubber was one of its most serious needs, so when the first merchant submarine, *Deutschland*, returned from its famous trip to this country, it was rubber that largely made up the cargo.

It is only eighty-five years since we have known how to use rubber yet it would set us back more than a century in the comfort and business of living if it should suddenly cease to be. As the use of animal skins for shoes paved the world with leather, so the invention of pneumatic tires and rubber soles and heels has cushioned the world with rubber.

You could not go through a single day without the service that rubber gives you. To be deprived of rubber bands, balls, buttons, buckles, of combs, supporters, elastics, bandages, rain-coats, erasers, of fountain pens, typewriters, motor trucks and motor cars, fire hose and factory belts, to mention just a few of the things rubber makes possible, would leave you wildly hunting for substitutes in order to go on with your day's work or pleasure.

Yet, the rubber industry is still in its infancy, and we have told you only the beginnings of what it will some day mean to us. Who knows which one of you, boys and girls now, will realize dreams of discovery, and manufacture that to-day seem only fantastic fairy tales of imagination? For the romance of rubber is only begun, and its wonder story of the future would thrill us all could we but hear it told.



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A REVIEW and QUESTIONS



HOW MANY CAN YOU ANSWER?

- What white man was first to see rubber?
- What did the natives use it for?
- Who was first to go up the Amazon?
- What royal person was first to use rubber?
- Where did it get its name?
- What were the first rubber articles America had?
- Why is a raincoat called a mackintosh?
- What is "vulcanizing"?
- What famous men fought over the patents in the courts?
- What has the beetle to do with rubber?
- Where does rubber come from and what is it?
- Is it like maple-tree sap?
- How many rubber producing trees are there?
- What tree is considered best?
- What climate does it need?
- What is meant by the rubber belt?
- What country long supplied the world's rubber?
- On what depends the amount of rubber annually taken out of that country?
- Who gets the laborers together?
- What is the rubber gatherers' village called?
- What is the rubber gatherer called?
- What is his day's work?
- Why is African rubber poor?
- How was rubber tamed?
- What is tamed rubber called?
- Why is it better than wild rubber?
- How are trees tapped?
- What proportion of the world's rubber now comes from plantations?
- What proportion of the whole supply does the United States use?
- What is synthetic rubber?
- Why is it not practical?
- Why are some manufacturers' goods better than others?
- What actions of Germany during the war show the regard that country had for rubber?
- How long have we known about rubber?

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